[10537/296]

CRASH BOX RADIATOR SUPPORT

FIELD OF THE INVENTION

The present invention relates to a crash box for a motor vehicle, e.g., for a passenger automobile.

BACKGROUND INFORMATION

The use of a crash box in a conventional passenger automobile is generally conventional. The purpose of the crash box is to absorb energy through controlled deformation in the event of an accident. To ensure that a damaged vehicle is inexpensive to repair, the separating point between a longitudinal beam and the crash box is generally in screw-connected form. This screw-connection point is often also used to secure other equipment holders, in which case the configuration must be such that the deformation of the crash box is influenced to the minimum possible extent.

German Published Patent Application No. 198 50 590 describes a front end region for a motor vehicle, in particular for a passenger automobile with a radiator or heat exchanger arrangement, which is connected to a front end structure at at least two bearing points. The at least two bearing points are designed such that in the event of impact-related deformation of the front end supporting structure, they link the heat exchanger arrangement into the deformation characteristic of the front end region in a force-transmitting and force-absorbing way. The heat exchanger arrangement, which may be composed of one or more heat exchangers, is braced into the front end supporting structure such that as a result of plastic deformation, it makes an additional contribution, in the manner of a soft barrier, to energy absorption and to the distribution of impact energy over large-area parts of the front end region. The region of use is in a front module of a

passenger automobile. Although the heat exchanger arrangement is linked into the deformation characteristics in a force-transmitting and force-absorbing way in the event of an impact-related deformation of the front end supporting structure, no details are provided as to the influence of the connection between the heat exchanger arrangement and the front end supporting structure.

German Published Patent Application No. 100 51 567 describes a vehicle front end structure. A front end element of the vehicle, which includes at least one radiator, has an upper projection, which is secured to an upper insertion hole in a front end wall of the vehicle, and a lower projection, which is secured to a lower insertion hole in the front end wall. If an external force which exceeds a predetermined level acts on the vehicle from the front side, the securing of the upper projection in the upper insertion hole is released, whereas the securing of the lower projection in the lower insertion hole is maintained. This makes it possible to prevent the entire front end element from being detached from the front end wall when the external force acts on the vehicle from the front side.

Accordingly, it is possible to prevent damage to the front end element as a result of the external force, and at the same time the front end element is prevented from hitting a road surface.

SUMMARY

An example embodiment of the present invention may provide an improved embodiment for a crash box for a motor vehicle.

In an example embodiment of the present invention, a mounting element (receiving part) for fitted parts, such as for example a radiator and/or heat exchanger arrangement, may be arranged

on the crash box with the minimum possible influence on the deformation characteristics of the crash box. The radiator and/or heat exchanger arrangement may be attached directly to the crash box, with the geometric configuration being such that the mounting element, which is U-shaped in form, receives a receiving bolt arranged on the radiator and/or heat exchanger arrangement.

The crash box has a plurality of fold beads arranged vertically and/or transversely with respect to a predetermined direction of deformation, with the mounting element being arranged such that in each case one limb of the U-shaped mounting element extends on either side of the fold beads, while the part which connects the two U-limbs of the U-shaped receiving part extends transversely with respect to the fold bead and has a similar curvature in the opposite direction to the fold bead, so that the deformation properties may not be impeded in any manner. The similar, opposite curvature also has the effect of ventilating the mounting element from behind, so that spray water which penetrates may run off or evaporate more quickly, thereby improving the resistance to corrosion.

In an example embodiment of the present invention, the crash box may include crash box parts arranged on both sides of the longitudinal center of the vehicle, and a radiator and/or heat exchanger arrangement, positioned vertically, may be arranged on the crash box, substantially transversely with respect to the longitudinal direction of the vehicle, the radiator and/or heat exchanger arrangement in each case having a left-hand and a right-hand receiving bolt, which is received by a respective left-hand and right-hand, upwardly open U-shaped receiving part which is arranged on the respective crash box part. The radiator and/or heat exchanger arrangement, in a mounting state, may be mounted such that it may rotate about an axis

defined by the left-hand and right-hand receiving bolt and may be slid downwardly into or upwardly out of the respective left-hand and right-hand U-shaped receiving part.

The result of this is that fitting of the radiator and/or heat exchanger arrangement may be considerably facilitated and accelerated, thereby making it a less expensive operation. To fit the radiator and/or heat exchanger arrangement, the latter is pushed in downwardly such that the two receiving bolts move into the respective U-shaped, upwardly open mounting elements, and is prevented from rotational movement along an axis defined by the two receiving bolts by at least one connection at a transverse bridge. There may be no need for further connection by screw connection, welding, etc. The radiator and/or heat exchanger arrangement is therefore fixed in the operating state and may easily be removed for repair and/or maintenance work by releasing the at least one connection at the transverse bridge.

Simple fitting and/or maintenance of the radiator and/or heat exchanger arrangement may be provided, which in times of ever increasing wage costs may help to reduce production and/or maintenance costs.

It may be possible to provide that the left-hand and right-hand receiving bolts have a rubberized protective sheath. The result of this is that any vibration noises which may occur between receiving bolts and crash box may not form or may not be transmitted, and consequently may have no adverse effect on driving comfort.

According to an example embodiment, it may be provided that the crash box is arranged at a front or rear end of a motor vehicle. Depending on the type of vehicle, a drive device and an associated radiator and/or heat exchanger arrangement may

be located in a front or rear part of the motor vehicle. The arrangement hereof may be configured such that it may be used in both the front region and the rear region of the vehicle without difficulty.

Further features and aspects hereof are described below with reference to the appended Figures.

It should be understood that the features described above and those which are yet to be explained below may be used not only in the combination indicated in each instance, but also in other combinations or as stand-alone measures without departing from the spirit and scope hereof.

Exemplary embodiments hereof are illustrated in the Figures and explained in more detail in the following descriptions, in which identical reference numerals denote identical or similar or functionally equal components.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a crash box according to an example embodiment of the present invention with a radiator and/or heat exchanger arrangement.

Fig. 2 is a detail view of a receiving bolt and a mounting element.

Fig. 3 is a detail view as in Fig. 2, but from a different perspective.

Fig. 4 is a cross-sectional view through a receiving bolt and a receiving part.

Fig. 5 is a detail view of a mounting element.

DETAILED DESCRIPTION

Fig. 1 illustrates a crash box arrangement which includes a left-hand crash box part 1 and a right-hand crash box part 2, a radiator and/or heat exchanger arrangement 3 and a receiving bolt 5 and a mounting element 4. The crash box parts 1, 2 are arranged on both sides of a vehicle longitudinal center and hold a radiator and/or heat exchanger arrangement 3, which is suspended between the two crash box parts 1, 2, is positioned vertically and is positioned substantially transversely with respect to a vehicle longitudinal direction.

The crash box parts 1, 2 form the crash box arrangement. The purpose of the crash box arrangement is to absorb energy through deformation along a deformation direction 12 in the event of an impact occurring substantially parallel to a vehicle longitudinal direction. As illustrated in Fig. 1, a plurality of fold beads 7, which are arranged vertically and/or transversely with respect to the predetermined deformation direction 12, are for this purpose incorporated in the crash box parts 1, 2. The fold beads 7 form an artificial weakening in the crash box parts 1 and 2 and effect compression and/or bending of the crash box parts 1, 2 at these weak points, and therefore an energy-absorbing action as a result of desired and predetermined deformation, in the event of a force which exceeds a predetermined level acting externally on a vehicle chassis.

The radiator and/or heat exchanger arrangement 3 has in each case a left-hand receiving bolt 5 and a right-hand receiving bolt 5', which engage in respectively associated U-shaped mounting elements 4 and 4' provided for this purpose. The U-shaped, upwardly open mounting elements 4, 4' are arranged on the associated crash box part 1 and 2 by weld spots.

In mounting state, the radiator and/or heat exchanger arrangement 3 may rotate about an axis of rotation 11, which is defined by the left-hand receiving bolt 5 and the right-hand receiving bolt 5'. At the same time, in the mounting state, the radiator and/or heat exchanger arrangement 3 may be slid downwardly into the mounting elements 4 and 4' or lifted out from the upwardly open U-shaped mounting elements 4, 4'. In an operating state, the radiator and/or heat exchanger arrangement 3 is fixed in place by a connecting element on a transverse bridge and may therefore be prevented from rotating about the axis of rotation 11.

As illustrated in Fig. 2, the radiator and/or heat exchanger arrangement 3 is suspended by the receiving bolts 5, 5' in the mounting elements 4, 4'. A rubberized protective sheath 6 is pulled over that end of the receiving bolts 5, 5' which is remote from the radiator and/or heat exchanger arrangement 3, which receiving bolts have been pushed vertically downwardly into the associated mounting element 4, 4'. The rubberized protective sheath 6 may prevent vibrations from being transmitted from the crash box parts 1, 2 to the radiator and/or heat exchanger arrangement 3 and visa versa, and also may prevent a noisy relative movement between the receiving bolt 5, 5' and the mounting element 4, 4'.

It can be seen clearly from Fig. 4 that the mounting element 4 is in each case arranged with a left-hand and a right-hand limb 9, 8 at an intermediate space 10 located between the fold beads 7, with the fold bead 7 itself remaining cut away. The axis of rotation 11 may extend centrally through the receiving bolt 5 and a base 14 of the fold bead 7. The head-like formation of that end of the receiving bolt 5 which is remote from the radiator and/or heat exchanger arrangement 3 may prevent the radiator and/or heat exchanger arrangement 3 from moving transversely with respect to the longitudinal direction

of the vehicle, i.e., along the axis of rotation 11, and thereby may fix it in place between the two crash box parts 1, 2.

As illustrated in Fig. 2 and Fig. 3, the mounting element 4 is arranged at a lower end of the fold bead 7. In principle, however, it is also possible for the mounting element 4 to be arranged at a different position along the fold bead 7. This is made possible by a curvature 13 extending in the opposite direction to the fold bead 7 and also parallel to the latter (cf. Fig. 5). The curvature 13, similarly to the fold beads 7 in the crash box parts 1, 2, forms a region which may readily be deformed along the deformation direction 12, i.e., transversely with respect to the profile of a curvature valley.

Moreover, the curvature 13 may provide for ventilation for the mounting element 4 from the rear, so that penetrating spray water may escape downwardly. Without the curvature 13, a blind formation may result, leading to standing water being present therein, with an increased risk of corrosion.

To summarize, the following points should be noted:

A plurality of fold beads 7 are incorporated in the crash box parts 1, 2, producing an artificial weakening and effecting compression and/or bending in the event of a forceful impact along the deformation direction 12.

U-shaped, upwardly open mounting elements 4, 4' are arranged on the crash box parts 1, 2 by weld spots.

The mounting element 4, 4' is fitted to the fold bead 7 such that in each case the left-hand and right-hand limbs 9, 8 are

arranged at the intermediate space 10, and the fold bead 7 itself remains cut away.

The mounting element 4, 4' has a curvature 13 extending in the opposite direction to the fold bead 7, (cf. Fig. 5) and, similarly to the fold beads 7, forms a region which is readily deformable.